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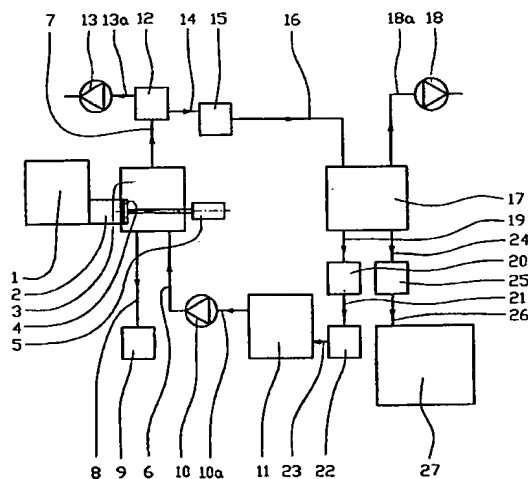
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(54) Title: METHOD AND PLANT FOR PRODUCING FEED PELLETS



(57) Abstract: There has been described a method of manufacturing feed pellets with a relatively high content of fat, for example in the form of added oil, which are treated during manufacturing in an atmosphere exhibiting a pressure, which is lower than the ambient pressure, the feed pellets being subjected to a drying process as feed pellets downstream of a pelleting device (1), the pelleting device (1) comprising for example a pelleting machine, alternatively an extruder, a so-called "universal pellet cooker", a so-called "boa compactor" or similar for the formation of feed pellets or material for feed pellets, are carried directly and without any intermediate transport device from the pelleting device (1) into an oil-filled pellet chamber (3) controlled through negative pressure. Further there has been described a plant to be used in the implementation of the specified method, comprising a pelleting device (1), in which an oil-filled pellet chamber (3) controlled through negative pressure, is surrounding and sealingly connected to the outlet (2) of the pelleting device (1).



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## METHOD AND PLANT FOR PRODUCING FEED PELLETS

This invention relates to a method of producing feed pellets, in which moist feed pellets in one process simultaneously are subjected to negative pressure, undergo a drying process and the pores of the feed pellets are filled with oil in order to achieve a lower total temperature load thereon.

The invention also relates to a plant for use in the implementation of the method, the plant generally comprising an oil-filled pellet chamber, which is preferably connected downstream of a pelleting machine, an extruding device for feed pellets or similar pellet-forming device, and in which the pellet chamber is followed by a separating unit, separating the pellets from surplus oil.

Feed pellets for fish and animals are industrially manufactured in a multi-stage process. The ingredients are mixed into a dough-like mass, which is formed into feed pellets by high pressure and high temperature, for example in a so-called extruder, after which the feed pellets are dried, filled with oil and cooled. As the pressure is relieved from

warm feed pellets, typically holding from 100 to 140 °C, to ambient pressure, the feed pellets expand due to internal pressure and liquid boiling out from the feed pellets. The expansion results in the feed pellets acquiring a porous structure.

The porosity or the specific gravity of the ready-shaped product may be an important quality criterion of several types of food and feed products, including feed pellets for farmed fish. The porosity of the product is important for the possibility of adding liquid nutrients which are absorbed into same; the porosity is further of importance for the floating properties in a suitable medium, and it is important for textural criteria like crispness, feeling to the mouth and toughness. In fish feed pellets the porosity is important with a view to the ability of the feed pellets to absorb oil in the manufacturing process, and for the floating properties/buoyancy in water when given out.

Existing production methods are hard to control accurately, so that the product will have the desired porosity or sufficient porosity for the products, feed-stuffs, feed pellets etc. to achieve a desired fat absorption.

For some products it will be important that the production process can be controlled towards a smallest possible expansion, for feed pellets, for example, whereas the opposite would be the case for other products. By production of, among other things, feed for pets, such as for example dogs and cats, and feed for farmed fish, this possibility of controlling the degree of expansion/degree of porosity is essential, because the aim is often to allow as much fat/oil as possible to be added in subsequent process stages. For

fish feed the control of its degree of expansion is extra important because such feed should in addition exhibit defined settling properties in water after the absorption of fat/oil.

5 The most common method of increasing the porosity, is to increase the amount of mechanical and thermal energy supplied to the raw materials in the extrusion step of the production process. When the basic mixture contains a surplus of vapour after extrusion, the surplus vapour will expand and result in  
10 greater porosity. With the same purpose compressed gas can also be supplied to the extruder, as disclosed in US patent document No. 5 587 193. In the patent publications WO No. 9503711 and No. 9816121 are described means of reducing porosity after the extruding stage, by drawing out positive  
15 pressure and surplus vapour inside the extruder.

After leaving the extruder or the pelleting machine or similar pellet-forming device, the feed pellets are cut into pieces of a desired length. Considerable remaining moisture in the expanded feed pellets entails that the feed pellets  
20 must be dried in order to have a long shelf-life. Such drying can take place in several ways, and some of these should be well known to a person skilled in the art.

A well-known drying method is drying of feed pellets in warm air. Such a drier can be arranged with one or more belts  
25 transporting the feed pellets through the drier. Such a drier can be divided into several zones with different air temperatures. The drier can also be arranged as a multi-storey tower (vertical drier), in which the feed pellets are dropped from floor to floor at defined intervals. The air  
30 temperature can vary from floor to floor. These driers all

have in common the long retention time, which may vary from 20 minutes to several hours, depending on the air temperature and the pellet size. This results in several well-known drawbacks. The feed pellets are subjected to a long-lasting  
5 temperature load, which is unfavourable for the stability of sensitive raw materials, and it reduces the nutritional value of the protein in the feed. For the operators on the production line the physical quality of the feed pellets can be judged only as the pellets leave the drier. Therefore, the  
10 drying stage results in a long feed-back time for possible adjustment of operational parameters of the extruder or corresponding equipment. Since the capacity of a production line per hour is typically in the range of 5 to 10 tonnes, this involves that a considerable volume of faulty production  
15 is on its way through the drier before necessary operational changes can be implemented. Thus, the effect of the adjustments cannot be judged until after another 30 minutes to 2 hours, etc.

Another known drawback of air driers is the need for cleaning  
20 large volumes of drying air of odours before discharging.

In the production of fish feeds it is common to supply extra fat, usually in the form of fish oil or vegetable oil, in a separate oil coating step after drying. The oil coating can take place at ambient pressure, or in a separate chamber, in  
25 which the pressure can be reduced to a pressure lower than the ambient pressure.

An alternative to air-drying is disclosed in the Norwegian patent No. 177731, in which ready-formed feed pellets are dried and simultaneously coated with a fatty substance by  
30 deep-frying treatment. The feed pellets are submerged in a

first hot oil bath at a temperature of 100 - 140 °C for between 45 seconds and 5 minutes, in order then to be transferred to another oil bath at a temperature below 100 °C.

5 In US patent document No. 5 527 553 a method has been explained, in which feed pellets are carried directly into a hot oil bath at 107-232 °C, and are cut to a desired length in the oil bath. The degree of expansion of feed pellets is controlled by changing the oil temperature. The hot oil bath  
10 will also work as deep-frying, so that the feed-pellets are dried at the same time. The drying effect depends on the transmission of energy from the oil to the water in the feed pellets. In this system the time of contact between feed pellets and oil is quite short, from 3-4 seconds up to 30  
15 seconds, so that a relatively great temperature difference between the oil and the feed pellets will be necessary. US patent document No. 5 527 553 prescribes an oil temperature of 107 - 232 °C, with 135 to 190 °C as a preferred temperature interval. However, such oil temperatures will  
20 have an adverse effect on the heat-sensitive raw materials, and the high temperature can reduce the nutritional value of the protein. It may also initiate oxidation processes, which will cause a reduction in the product's storage stability. Extra energy is also required in order to heat the oil to  
25 such high temperatures. The oil is not only to be absorbed into the feed pellets, but it also works as a transport medium to get the feed pellets away from the extruder unit. By such temperatures, fish oil, which is a commonly used oil in the manufacturing of fish feed pellets, will have a burnt  
30 smell, and it will give off gasses perceived as unpleasant by humans, which often results in a work environment problem. Practical, industrial use of the method described in patent

document No. US 5 527 553 will therefore require considerable investments in equipment that can handle oil at such temperatures, equipment for the recovery of energy, and equipment protecting the work environment.

5 US patent document No. 5 527 553 specifies only schematically how feed pellets and surplus oil should be separated after the process. It is indicated that oil and feed pellets are carried across a movable grid, where the oil runs off, while the feed pellets are carried forward to be packaged. Further  
10 it is specified that air can be blown over the feed pellets to enhance the running off, while at the same time a cooling effect is achieved. Practical experiments show that this does not give a satisfactory result, as the feed pellets will be covered by an oil film, which will result in a considerable  
15 amount of free oil when the product is packed in sacs.

It is well known to a person skilled in the art that the boiling point of water is reduced in reduced atmospheric pressure. The boiling point of water is thus 100 °C by atmospheric pressure (1013 millibar), 80 °C by 474 millibar  
20 and 50 °C by 123 millibar. It is also well known that the partial pressure of a gas in a liquid is proportional to the pressure above the liquid. In a system according to the invention the pressure of the oil column above the pellet chamber will be negligible relative to the atmospheric  
25 pressure. According to the invention the pressure above the oil column, that the pellet chamber forms part of, will be reduced, which results in a reduction in the vapour pressure of the water in the oil. This results in a transformation of the water in the feed pellets to vapour form by a lower  
30 temperature. Thus oil at a lower temperature than that specified in US patent document No. 5 527 553 can be used in



order to dry the feed pellets. Thereby more favourable drying conditions are achieved as regards nutritional value and storage stability.

5 An object of the invention is to provide a method and a plant of the kind initially mentioned, to be used in the manufacturing of porous feed pellets, wherein better control can be maintained of the porosity of the feed products than by known technique.

10 Another object is to achieve a quicker drying of the product, while at the same time achieving a lower total temperature load on the product than by known technique.

A third object is to achieve better control of the feed absorption of feed pellets.

A fourth object is to achieve an energy-efficient process.

15 A fifth object is to obtain a process, in which the time from the formation of the feed pellet until the product is ready to be packed, is substantially shorter than by known technique.

20 A sixth object is to obtain a closed process, which reduces the risk of contamination, for example from the salmonella-bacterium.

A seventh object is to obtain a continuous process without intermediate storing and internal transportation of feed pellets.

In a method of the kind initially mentioned, these objects are realized by a procedure in accordance with the characterizing part of the following Claim 1, and by a plant of the kind initially mentioned for the implementation of the method, being formed so that it exhibits the features specified in the characterizing part of Claim 7.

According to the invention the procedure is such, that feed pellets are produced by, discharged by or extruded by a pressure which is lower than the ambient pressure, feed pellets being discharged directly to an oil-filled chamber, in order to be transported subsequently in the oil flow to a separating unit, which separates the feed pellets from surplus oil, said separating unit being operated at the same or a different pressure.

A plant for the implementation of this method comprises an oil-filled pellet chamber interconnected in the plant downstream of the pelleting machine, and the plant distinguishes itself by said pellet chamber being arranged to allow a pressure lower than the ambient pressure to be maintained, for example in the order of 100-800 millibar. Further, the plant comprises a separating unit, which is arranged to operate by atmospheric pressure or by a pressure lower than the ambient pressure, for example in the order of 100-800 millibar, and such that the pressure in the pellet chamber may be different from the pressure in the separating unit.

According to the invention, this is normally done in practice by extruding feed pellets in a manner known in itself, but with the important difference that the extruder delivers feed pellets into said oil-filled chamber, which works at a

reduced pressure. The application of reduced pressure will in this connection give a lower boiling point, i.e. little temperature load on the feed, as the temperature of the oil can be reduced to achieve the same drying effect as by atmospheric pressure. Feed pellets subjected to reduced pressure will also expand more than they otherwise would, and increased evaporation of water contributes to the attainment of a more porous feed pellet. The expansion can be controlled by adjustment of the negative pressure and by changing the oil temperature in the pellet chamber. Experiments carried out so far, have shown that the retention of the feed pellets by the reduced pressure may be of short duration, in a typical case from a few seconds and up to one minute, after which the feed pellets are carried to a separation process for feed pellets and surplus oil to be separated.

The table below shows the results obtained in a series of experiments with extruded fish feed, by the use of the method and a plant in accordance with the invention. Diet A contained 25 % wheat, 48 % fish meal and 27 % maize gluten (given in % of dry blend fed into an extruder before addition of water). Diet B contained 17 % wheat, 54 % fish meal and 29 % maize gluten. The values are measured or analysed values, whereas the values in the column "Water content in non-greasy dry matter in finished product" are calculated values and indicate the effect of drying, as opposed to "Water content in finished product", which is a function of both oil absorption and drying.

The results show that both oil temperature and pressure are of importance for the water content in the final product. The water content in the extrudate is of less importance for the water content in the final product. The results also show

that both oil temperature and pressure are of importance for the fat content in the final product. A higher fat content indicates that the feed pellet has expanded more, accordingly increased porosity. The results also show that the feed  
 5 pellets are dried better by increasing oil temperature and by decreasing pressure. The feed pellets produced were of good quality.

The experiments thereby show that the invention provides a new and powerful control means for controlling the feed  
 10 pellet manufacturing process. The experiment referred to, is only illustrative and does not limit the scope of the invention.

Diet	Pressure (mbar)	Water content out of the extruder (%)	Oil temp. (°C)	Fat in final product (%)	Water content in finished product (%)	Water content non- fatty dry matter in finished product (%) <sup>1</sup>
A	1000	21,9	65	37,7	11,2	18,0
A	700	24,7	65	41,7	10,3	17,7
A	400	20,4	65	42,6	9,6	16,7
A	300	19,6	65	43,8	8,7	15,5
A	200	18,5	81	47,7	7,7	14,7
B	700	25,5	105	57,6	8,1	19,1
B	200	25,5	105	57,2	5,9	13,8
B	1000	16,4	110	36,8	9,8	15,5
B	700	16,4	110	37,7	9,1	14,6
B	200	16,4	110	45,4	6,1	11,2
B	200	16,4	110	52,0	5,7	11,9

<sup>1</sup> Calculated values

In said experiments the retention time in the oil flow by negative pressure was from 3 to 10 seconds.

As mentioned in the above description, a plant according to the invention for use in the manufacturing of feed pellets, is provided with an oil-filled pellet chamber, which is arranged to be maintained at a pressure lower than the ambient pressure. By its outlet the oil-filled pellet chamber is connected to a separating unit, to which feed pellets are transferred, the separating unit similarly being arranged to be kept at a pressure lower than the ambient pressure.

It has proved convenient to let the subsequent separating process also be carried out at a pressure lower than the ambient pressure. This step of the method is advantageous in that it favours the realization of the intended aim, but this step is not critical of the implementation of the method for the attainment of a satisfactory result.

Similarly, the invention comprises a method, in which pelleting and drying are carried out at a first reduced pressure, whereas the subsequent separation of feed pellets and surplus oil is carried out at a second reduced pressure.

Said first pressure and said second pressure can be identical or different from each other.

As mentioned, reduced temperature will be favourable for the temperature-sensitive ingredients in the feed, and increased porosity is favourable for the oil-absorbing property of the feed pellets. Through a negative pressure chamber the outlet of the pellet chamber can have a lock element arranged thereto, which makes it possible to take out formed feed

pellets continuously or in batches, the negative pressure being maintained at the same time.

According to the invention, feed pellets are produced in a pelleting machine and carried from there into said oil-filled pellet chamber working at a reduced pressure. The degree of negative pressure relative to the atmospheric pressure is adjusted with a view to the expansion wanted in feed pellets. This is done in cooperation with the adjustment of the oil temperature, which also affects the degree of expansion. It has turned out that the method according to the invention provides essentially better control of the expansion and porosity than action taken in a known manner before or during pelleting. The reason is believed to be that changes to single parameters in the pelleting process also affect other parameters of importance for a good result. This is because the pelleting process affects the physical and chemical structure of the raw materials by means of the same measures that control expansion, such as heat, water and pressure.

The pressure in the pellet chamber can be in the pressure range from 0 millibar up to just under atmospheric pressure, and will in typical cases be between 100 and 800 millibar.

According to the method of the invention porous feed pellets are produced in a manner known in itself, but with the new feature of feed-pellets being delivered to an oil-filled pellet chamber, which is maintained at a pressure lower than the ambient pressure, typically in the range one hundred to eight hundred millibar, and in which the oil temperature is maintained in a range above the water boiling point for the relevant working pressure, typically in the range from 50 to 180 °C.

According to the method of the invention water is removed from the feed pellets, and the pores are filled with fat in the one and same process step.

According to the invention the outlet of pelleting equipment  
5 known in itself has an oil-filled pellet chamber arranged thereto, which is arranged to be maintained at a pressure lower than that of the surroundings, and is provided, through an outlet and a negative pressure chamber, with a lock gate, so that feed pellets can be drawn continuously or in batches  
10 from the pellet chamber through the negative pressure chamber while this is kept at a reduced pressure.

A device for practicing the invention is described in the following by means of a non-limiting exemplary embodiment. Reference is made to the appended drawings, in which:

15 Fig. 1 shows schematically a plant for the production of feed pellets;

Fig. 2 shows schematically the plant of Fig. 1 in an alternative embodiment; and

Fig. 3 shows schematically the plant of Fig. 1 in a further  
20 alternative embodiment.

In the figures of the drawings, the reference numeral 1 identifies a pelleting machine provided with an outlet 2 opening into a pellet chamber 3. The pellet chamber 3 has a rotating knife 4 arranged thereto with a drive unit 5, which  
25 is arranged to cut feed pellets into suitable lengths. The pellet chamber is provided with an inlet for oil 6, whereby

said inlet 6 may be positioned vertically below the outlet 2 of the pelleting machine, or horizontally relative to the outlet 2, or at any angle between vertical and horizontal position. The pellet chamber has an outlet 7 for oil and feed pellets, whereby the outlet 7 can be placed vertically relative to the outlet 2 of the pelleting machine 1, or horizontally relative to the outlet 2, or at any angle between vertical and horizontal position. The positioning of the inlet 6 and the outlet 7 decides the direction of flow of the oil past the outlet 2 of the pelleting machine 1, in which direction the feed pellets are transported out of the pellet chamber 3. To the pellet chamber 3 there is also arranged a discharging outlet 8 with associated discharging unit 9. The discharging outlet 8 and the discharging unit 9 may alternatively be mounted on the oil inlet 6. A pump 10 is arranged to supply the pellet chamber 3 with warm oil from a reservoir 11 through a supply pipe 10a and the inlet 6. The reservoir 11 is provided with a not shown heating element with associated adjusting equipment and energy supply not shown. The function of the heating element is to heat the oil to a desired temperature. Oil and feed pellets run from the pellet chamber 3 through the outlet 7 into a negative pressure chamber 12. The negative pressure chamber 12 is connected by a channel 13a to a first vacuum pump 13, which is arranged to maintain the air pressure in the negative pressure chamber 12 and thereby also the pellet chamber 3, at a first desired value lower than that of the ambient pressure. By the application of a technique known in itself, the negative pressure chamber 12 forms a separator, which is arranged to prevent oil and feed pellets from being sucked into the first vacuum pump 13. At its lowest level, the negative pressure chamber 12 is provided with an outlet 14, where there is placed a lock device 15 of a kind known in



itself, so that the low pressure in the pellet chamber 3 and the negative pressure chamber 12 can be maintained, while feed pellets and oil are being discharged. The lock device 15 may with advantage be of the rotating type, so that feed pellets and oil can be discharged continuously from the pellet chamber 3 and the negative pressure chamber 12. Through an inlet 16 the lock device 15 is connected to a separating unit 17. Through a channel 18a the separating unit 17 has a second vacuum pump 18 arranged thereto, which is arranged to maintain the air pressure in the separating unit 17 at a second desired value, which is lower than that of the ambient pressure. The separating unit 17 is internally provided with a not shown separating device of a kind known in itself, which is arranged to separate feed pellets from oil. The separating device may for example comprise an arrangement of fixed grids, movable grids and/or belts. At its lowest level the separating unit 17 is provided with an outlet 19, in which there is placed a lock device 20 of a kind known in itself, so that the low pressure in the separating unit 17 can be maintained while the oil is being let out. The lock device 20 may with advantage be of the rotating type, so that oil can be discharged continuously from the separating unit. Through an inlet 21 the lock device 20 is connected to a cleaning unit 22. The cleaning unit 22 may for example comprise a filter arrangement, a separator or a decanter. Purified oil is returned to the oil reservoir 11 through a pipe connection 23. The separating unit is further provided with an outlet 24 with a lock device 25 of a kind known in itself, so that the low pressure in the separating unit 17 can be maintained while feed pellets are being discharged. The lock device 25 may with advantage be of the rotating type, so that feed pellets can be discharged continuously from the separating unit 17. Through an inlet 26

the lock device 25 is connected to a cooling unit 27 of a kind known in itself. From the cooling unit 27 feed pellets are carried to a packing unit/department not shown.

In an alternative embodiment two or more oil reservoirs 11, 11a are used, see Fig. 2. Each oil reservoir 11, 11a is arranged to be maintained at a constant temperature, and so that the temperature is different between the reservoirs 11, 11a. The desired operational temperature is achieved by mixing the oils from the reservoirs 11, 11a, flowing through a channel 10b and 10c, respectively, in a suitable mixing unit 28 of a kind known in itself, before the oil is passed by means of the pump 10 into the pellet chamber 3 through the inlet 6.

In a further alternative embodiment, see Fig. 3, the inlet 16 of the separation unit 17 is provided with a valve 16a or opening, which is connected directly or indirectly to the surrounding room, and thereby makes it possible for the pressure in the inlet 16 to be equal to the atmospheric pressure. In this alternative embodiment a further lock device 15a must form the connection between the inlet 16 and the separating unit 17, so that the low pressure in the separating unit 17 can be maintained.

## C L A I M S

1. A method of manufacturing feed pellets with a relatively high fat content, for example in the form of added oil, and treated during the manufacturing in an atmosphere exhibiting a pressure, which is lower than the ambient pressure, wherein the feed pellets are subjected to a drying process, characterized in that downstream of a pelleting device (1), said pelleting device (1) comprising for example a pelleting machine, alternatively an extruder, a so-called "ultra-short time pellet cooker", a so-called "boa compactor" or similar, for the formation of feed pellets or material for feed pellets, feed pellets are carried directly and without any intervening transport device, from the pelleting device (1) into an oil-filled pellet chamber (3) controlled by negative pressure.
2. A method as claimed in claim 1, characterized in that the oil in the pellet chamber (3) is adjusted in terms of temperature and/or quantity.
3. A method as claimed in one or more of the preceding claims, characterized in that the oil/pellet mixture is carried to a downstream negative pressure-controlled separating process, in which the pressure may be equal to or different from the pressure in the pellet chamber (3).
4. A method as claimed in one or more of the preceding claims, characterized in that transport

of the oil/pellet mixture from the pellet chamber (3) to the subsequent separating process can be implemented at a pressure different from the pressure conditions prevailing in the pellet chamber (3) and a separating unit (17).

5

5. A method as claimed in one or more of the preceding claims, characterized in that the drying process is carried out in oil.

10

6. A method as claimed in one or more of the preceding claims, characterized in that the pressure in the pellet chamber (3), the separating unit (17) and the intervening transport system, can be lower individually than the atmospheric pressure, typically 200 to 800 millibar.

15

7. A plant to be used in the implementation of the method specified in claim 1, comprising a pelleting device (1) for the formation of feed pellets or material for feed pellets, and a pellet chamber (3), characterized in that an oil-filled pellet chamber (3) controlled by negative pressure is connected in a surrounding and tightening manner to the outlet (2) of the pelleting device (1).

20

25

8. A plant according to claim 7, characterized in that the oil in the pellet chamber (3) is arranged to be temperature-controlled, for example by one or more of the oil-carrying ingredients comprising a reservoir (11), a supply pipe 10a, a channel 10b and a channel 10c, being provided with at least one heating element.

9. A plant according to one or more of the claims 7 to 8,  
c h a r a c t e r i z e d i n that the pellet chamber  
(3) is connected pressure-tight, for example through one  
or more lock devices (15), to a separating unit (17)  
5 controlled by negative pressure.
10. A plant according to one or more of the claims 7 to 9,  
c h a r a c t e r i z e d i n that the pellet chamber  
(3) has a first vacuum pump (13) arranged thereto, which  
is arranged to maintain the air pressure inside the  
10 pellet chamber (3) at a first desired value, lower than  
that of the ambient pressure, and that the separating  
unit (17) has a second vacuum pump (18) arranged  
thereto, which is arranged to maintain the air pressure  
in the separating unit (17) at a second desired value,  
15 which is lower than that of the ambient pressure,  
possibly also different from said first value.

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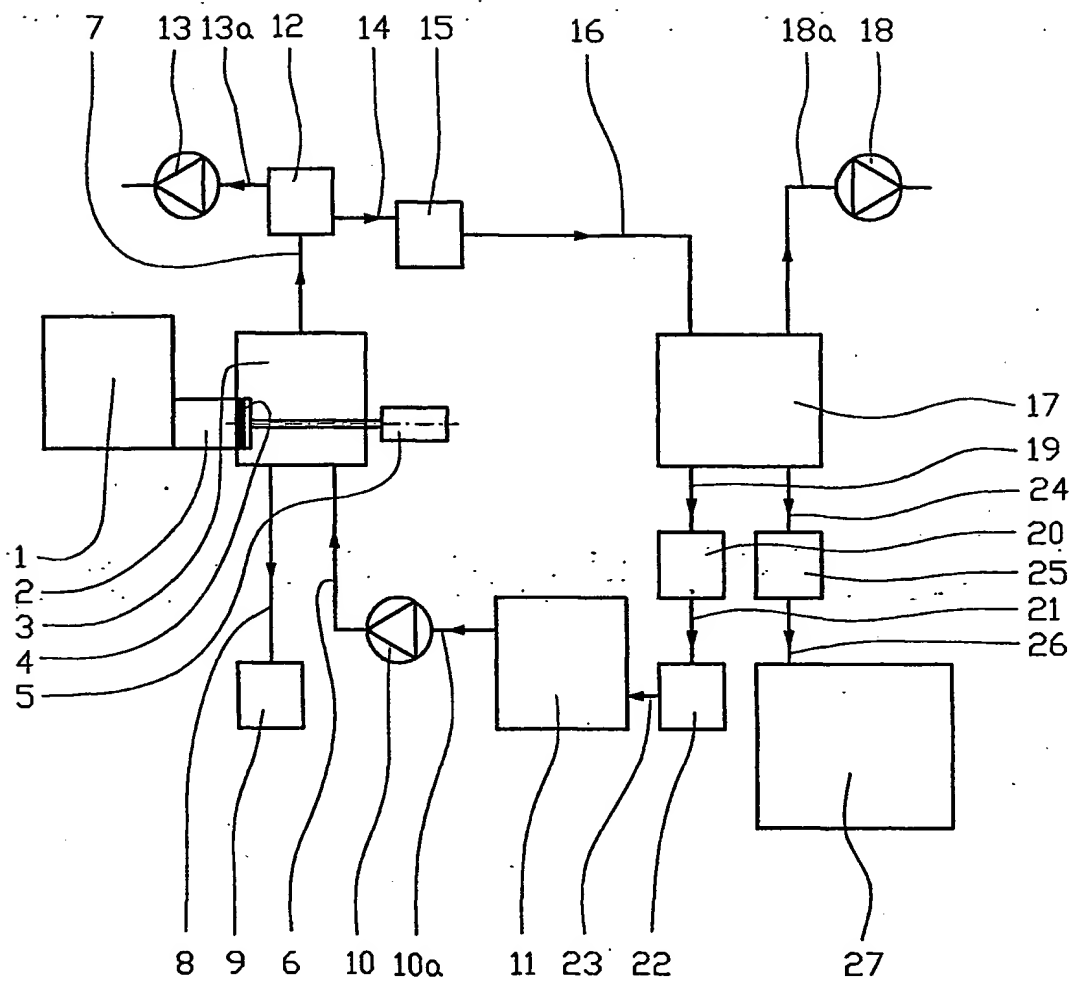


Fig. 1

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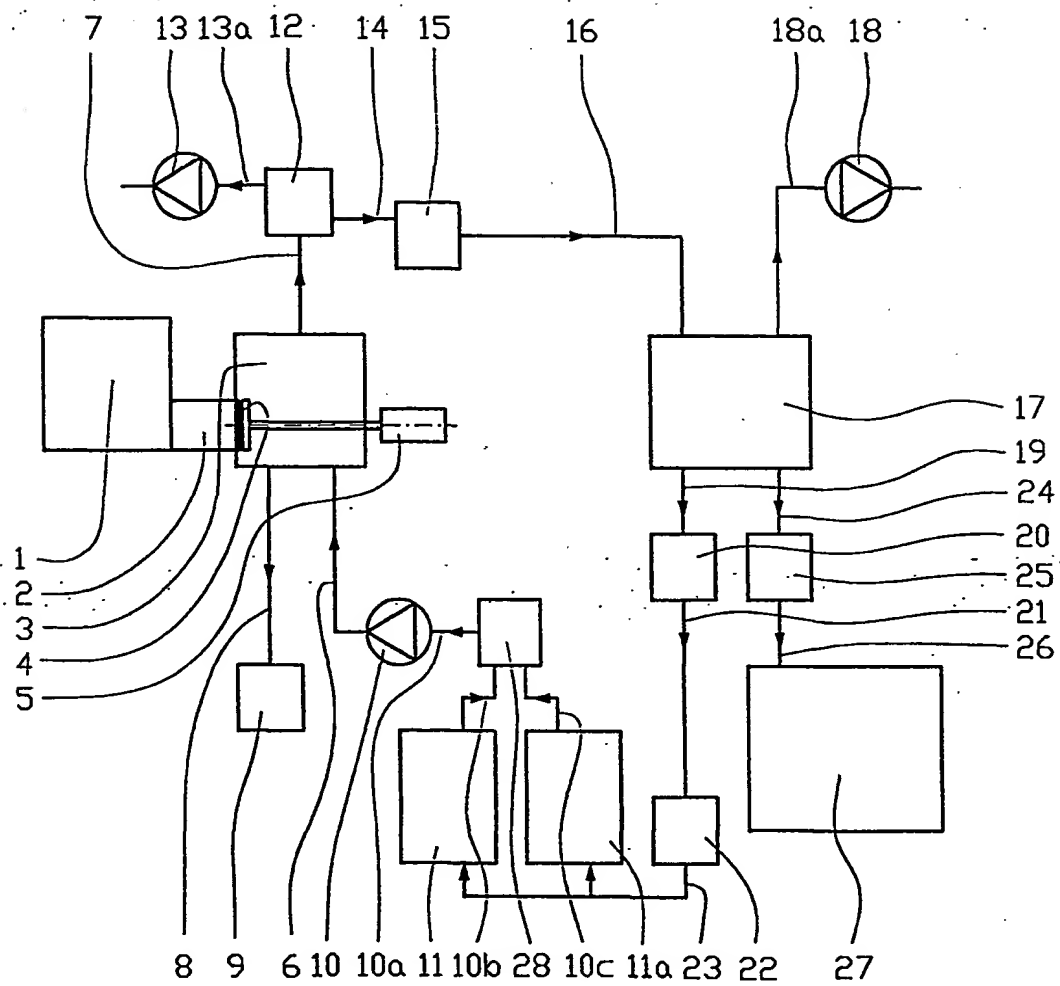


Fig. 2

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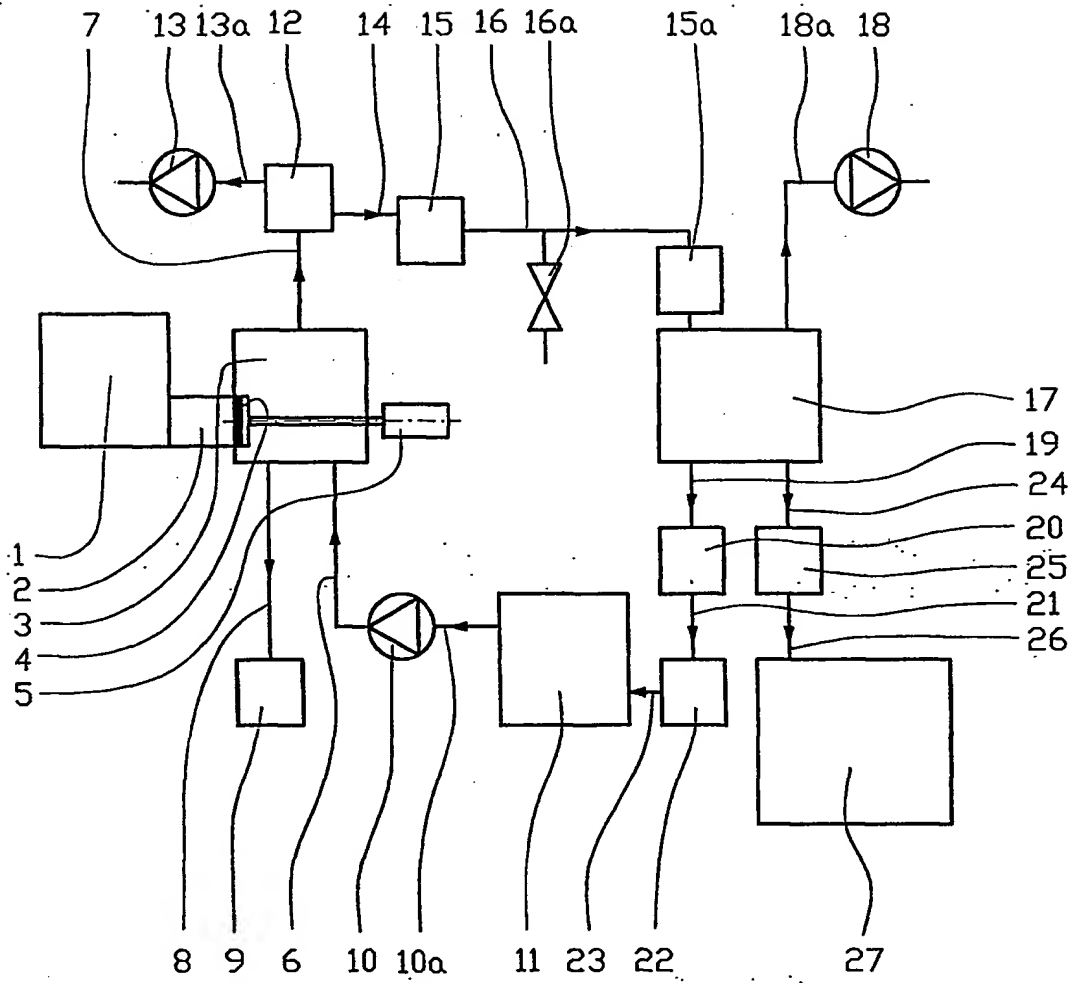


Fig. 3



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 01/00373

<b>A. CLASSIFICATION OF SUBJECT MATTER</b>		
IPC7: A23K 1/00, A23K 1/18, A23N 17/00 According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b>		
Minimum documentation searched (classification system followed by classification symbols)		
IPC7: A23K, A23N		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
SE,DK,FI,NO classes as above		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 9849904 A2 (ENOS LIMITED), 12 November 1998 (12.11.98), claims 1 and 11, page 6, line 18 - line 20, line 22 - line 25; page 7, line 1 - line 4 --	1-6
P,X	WO 0057718 A1 (NUTRECO AQUACULTURE RESEARCH CENTRE AS), 5 October 2000 (05.10.00) --	1-10
A	WO 9816121 A1 (WENGER MANUFACTURING, INC.), 23 April 1998 (23.04.98) --	1-10
A	NO 991081 A (NISSHIN FLOUR MILLING CO., LTD.), 4 March 1999 (04.03.99) --	1-10
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
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Date of the actual completion of the international search		Date of mailing of the international search report
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PCT/NO 01/00373

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